

*Report of the Kew Committee for the Fifteen Months
ending October 31, 1872.*

THE Kew Observatory was handed over to the President and Council of the Royal Society by the General Committee of the British Association at the Edinburgh Meeting in 1871. Since that time the operations of the establishment have been conducted under the directions of the Committee nominated by the President and Council of the Royal Society.

The most important modifications which have been made in the staff of the Observatory have been:—first, the appointment of Mr. Samuel Jeffery as Superintendent, in the place of Dr. Balfour Stewart, F.R.S., who had resigned his office previous to the severance of the connexion between the Observatory and the British Association; and, secondly, the resignation of Mr. Robert Beckley, who had been for nearly eighteen years Mechanician, such an official being no longer required. His connexion with the Observatory is not, however, entirely at an end, for he has been appointed Consulting Mechanician with a retaining fee of Ten Pounds per annum.

Mr. Robert H. Scott, F.R.S., has consented, at the request of the Committee, to act as their Honorary Secretary.

Magnetic Work.—The series of automatic records of the several Magnetographs, viz. Declinometer, Horizontal Force, and Vertical Force instruments, have been continued, and the independent absolute determinations have been, as usual, made monthly. This latter duty has been, as heretofore, performed by Mr. G. M. Whipple, B.Sc., first Assistant, who also takes charge of the General Magnetic Work, in which he has the assistance of Mr. Cullum. The salaries of these two gentlemen, whose time is chiefly devoted to magnetic work, amounted during the period under consideration to £308 2s. 6d., leaving a balance of about £300 out of the sum of £600 received from the Royal Society to meet the general expenses (£2084 12s. 9d.) of the Observatory. £767 18s. 5d. of this amount has been defrayed by the Meteorological Office and other sources, such as the £300 received for the payment of arrears from the

British Association (the greater part of which has been already expended), fees for verification of instruments, and payments for new instruments for foreign observatories, leaving a balance in hand of £85 5s. 6d. on the 31st of October.

The state of the Magnetic Reductions, as exhibited in the Report of the British Association for 1871, remains unaltered, with the exception of the Tabulations of Declination, which have been extended to the end of the year 1871. The discussion of the results has been undertaken by the Chairman of the Committee, Sir E. Sabine, who has made arrangements for the constant attendance at Kew since November 1871 of two sergeants of the Royal Artillery who were formerly located in his office at Woolwich. Accommodation has been provided for them at Kew by partitioning off a portion of the Transit Room.

Meteorological Work.—The several self-recording instruments, registering respectively the Pressure, Temperature, Vapour-tension, Rainfall, and Wind, have been maintained in constant action under the superintendence of Mr. T. W. Baker, second Assistant, aided by Mr. Foster; and the daily standard eye observations for control of the photographic records have been made regularly.

The instrumental traces with hourly tabulated values are sent monthly to the Meteorological Office as in former years. The Barograms and Thermograms are printed off in duplicate, and one copy is preserved at Kew. As regards the Anemograms and Rain-records, the copy has been obtained by the method of tracing.

In addition to the regular work of Kew as a Magnetical and Meteorological Observatory, the duty of examining and checking the work of all the seven Self-recording Observatories in connexion with the Meteorological Office has been carried on in accordance with the method described in the Report of the British Association for 1869. This portion of the work has been performed by Messrs. Page and Rigby.

The only change as regards the Meteorological Instruments has been the repair of the shafts which connected the Anemograph on the Dome with the registering apparatus. About the middle of June it was discovered that the old tubular shafts were split, and they were therefore replaced by new ones.

Photoheliograph.—This instrument was regularly worked, as in former years, up to the end of February 1872, at which epoch the period expired which was originally fixed by Mr. De La Rue for the continuance of the observations at the expense of the Royal Society Government-Grant Fund. The observations were afterwards carried on up to the end of March, with the object of fully including ten years. The measurements and reductions of the sun-pictures have been continued at the expense of Mr. De La Rue, and will be completed during the ensuing year. A scale of equal parts, 15 feet in length, has, with the sanction of Her Majesty's Office of Works, been erected temporarily on the Pagoda at

the Royal Gardens, Kew, likewise at the expense of Mr. De La Rue*. This is being photographed by the Kew Photoheliograph for the purpose of determining the optical distortion (if any) of that instrument, in order to furnish the final corrections to the reductions of the sun-pictures made with it.

A Heliograph for Pulkowa has been placed in the Dome, and photographs have been taken of the scale in order to determine its optical character. This instrument has since been removed; but the stages and preparations for future instruments remain *in situ*, and will be used for testing the other instruments to be employed for the observations of the transit of Venus.

Since March, when the sun-photograms were discontinued, eye observations of the sun, after the method of Hofrath Schwabe, have been made with a telescope of $2\frac{3}{4}$ inches aperture (lent by Sir E. Sabine) by Mr. Foster, in order that the observations for connecting sun-spots with magnetic phenomena might not drop through until photographic records are taken up on a permanent footing.

Electrometer.—This instrument, designed by Sir W. Thomson, F.R.S., was provided by the Meteorological Committee in 1869, but has never been systematically in operation. It was dismantled early in the year, in order to be removed to another position. Previous to its re-erection some modifications are required; and accordingly, on a recent visit to London of the maker, Mr. White, of Glasgow, that gentleman came down to Kew (September 28) and removed a considerable portion of the apparatus in order to effect the necessary alterations at home.

Verifications.—This department of the Observatory has been in full activity during the year. The following Magnetic Instruments have been verified to obtain new constants :—

A Unifilar for the North-American Boundary Commission.

A Unifilar, a Dip-circle, and Fox's Instrument, for H.M.S. 'Challenger,' the first two having been formerly used on board H.M.S. 'Nassau.'

* Disbursements by Mr. Warren De La Rue from February to October 31, 1872 :—

	£	s.	d.	£	s.	d.
Paid to Mr. Loewy for measuring and reducing the position of spots to the end of October	75	0	0			
„ Mr. Whipple for area measurements.....	20	0	0			
				95	0	0
„ Mr. Munro for Scale	30	7	6			
„ Mr. Jeffery for erection of the Scale	20	0	0			
				50	7	6
„ Mr. Whipple for Chemicals	10	0	0			
„ „ Photographing Scale	5	0	0			
„ Mudd and Son for experiments with Dry Plates	2	3	6			
„ Mr. T. Coleman for Photographic Printing.....	0	15	6			
				17	19	0
				£163	6	6

In addition a considerable number of Instruments have been ordered on commission for several foreign and other observatories, and transmitted to their respective destinations after verification at Kew. The list is as follows :—

A complete set of Magnetographs, on the pattern of the Kew instruments, for Prof. C. Jelinek, Director of the Central-Anstalt für Meteorologie und Erdmagnetismus, Hohe Warte, Vienna.

A Unifilar for Prof. Iwan Smirnow, Kasan.

A Unifilar for Prof. Balfour Stewart, F.R.S., Owens College, Manchester.

A Dip-circle for the Survey Office, Lisbon.

A Dip-circle for Prof. Karlinski, Observatory, Cracow.

A Dip-circle for Prof. Balfour Stewart, F.R.S., Owens College, Manchester.

2 Dip-needles for Prof. Jelinek, Vienna, together with alterations to 4 others connected with a Repsold's Dip-circle.

The Meteorological Instruments which have been verified have been as follows :—

Barometers, Standards	34
„ Marine and Station	73
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	107
Aneroids	17
Thermometers, Ordinary Meteorological ..	1219
„ Boiling-point Standards ..	31
„ Mountain	16
„ Clinical	1395
	<hr/>
	2661

In addition, 12 Standard Thermometers have been calibrated and divided at Kew, and 12 Maximum and 12 Minimum Thermometers have been verified, the latter being tested down to the freezing-point of mercury. These instruments have been ordered by Mr. G. T. Kingston for the meteorological organization of the Dominion of Canada.

Hydrometers

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The following miscellaneous instruments have also been verified :—

Theodolite	1
Sextants	3
Cathetometer Scale	1
Rain-gauge	1, with 2 graduated glasses.
Evaporating Dish	1, with 1 graduated glass.
Robinson's Dial Anemometers .	4

An Anemometer, of a similar construction to the instruments belonging

to the Meteorological Committee, but modified by Mr. Beckley, on the suggestion of Mr. De La Rue, so as to express the velocity by hourly traces, the pencil returning at the expiration of each hour to the zero-line, and also to admit of a range to the extent of 100 miles in the hour, has been tested and found to work satisfactorily.

Various other Anemometers of different constructions have been under experiment; but from the limitation of the space forming the Observatory garden, by trees, &c., it was not practicable to test thoroughly their respective merits.

Waxed paper for photographic purposes has been supplied to the India Office ($2\frac{1}{2}$ reams), the Meteorological Office (5 reams), and the Lisbon Observatory ($\frac{1}{2}$ ream).

Instruction in the use of Magnetical or Meteorological Instruments has been given to the following gentlemen:—

Prof. H. F. Blanford, Meteorological Reporter to the Government of Bengal, in Meteorological work.

The Right Rev. the Bishop of Rupert's Land, in Meteorological work.

Charles Carpmael, Esq., B.A., Assistant to Mr. Kingston, Magnetic Observatory, Toronto, Canada, in both Magnetical and Meteorological work.

Three Officers of the North-American Boundary Commission, in Magnetical work.

Three Officers of H.M.S. 'Challenger,' in Magnetical work.

Instruments and Apparatus.—The several pieces of Apparatus &c. enumerated in the Inventory (Appendix II. of the Report of the British Association, 1871) have been handed over to the Kew Committee, and are in their charge.

In the month of July instructions were received from the Foreign Office to deliver to Capt. Anderson, R.E., an officer attached to the North-American Boundary Commission, the Magnetic Instruments used by the previous Commission, which had been deposited at Kew by the late Major R. W. Haig, R.A. Accordingly the following instruments were given up to Capt. Anderson:—A portable Unifilar, a Dip-circle, and an Azimuth Compass.

The last-named instrument, although deposited by Major Haig, was not mentioned in the letter from the Foreign Office, and it was therefore issued to Capt. Anderson on loan.

The Dip-circle mentioned in the last Kew Report of the British Association has been lent to His Excellency Major-General Lefroy, Governor of Bermuda.

A portable Dip-instrument, which had been lent to the Astronomer Royal for a brief period, has been returned by him.

Buildings.—Some slight alterations have been made in the main buildings in order to afford additional accommodation.

A small closet in the Testing-room has been converted into a Lavatory.

An office has been provided for the two Sergeants, R.A., who attend at Kew, as already reported, by the subdivision of the old Transit Room about midway with a panel partition. The expense of this alteration has been defrayed by Sir E. Sabine.

The roofs of the two outer Magnetic houses have been re-covered with felt, as it was found that they could not be kept perfectly water-tight by a coating of tar.

Early in the year, on the application of the Committee, H.M.'s Office of Woods and Forests sent workmen to clean and paint the interior of the Observatory, as far as the ground-floor. This work has been finished, and the Office has undertaken to complete the basement story in the course of the next year.

Library.—The Books enumerated in Appendix III. to the Report of the Kew Committee of the British Association for 1871 have been left at Kew.

A most valuable donation was received in July from the Committee of the Athenæum Club, consisting of 77 volumes of books, chiefly Greenwich Observations.

From Sir E. Sabine a number of volumes of the 4to *Magnetical and Meteorological Results* from the Colonial Observatories have been received; and also a very considerable amount of MS. documents, including, among others, the original observations from which the printed results above mentioned have been derived.

A large number of valuable books have been deposited at Kew by Sir E. Sabine, who has intimated his intention to present them ultimately to the Observatory as a foundation of a Library.

Staff.—The Staff employed at Kew is as follows:—Mr. Samuel Jeffery, *Superintendent*; G. M. Whipple, B.Sc., *First Assistant*; T. W. Baker, *Second Assistant*; F. J. Page, A. J. Rigby, J. E. Cullum, J. Foster, F. Figg.

The last-named gentleman was substituted in May for T. Hill, who had resigned in April.

Visitors.—The Observatory has been honoured during the year by the presence of several scientific men of eminence; amongst these may be mentioned:—

Professor E. Alluard, Clermont, Puy de Dôme, Director of the Meteorological Observatory on the Puy de Dôme.

Professor Guthrie, F.R.S., with twenty-five Teachers (Science and Art Department).

M. W. de Fonvielle, on behalf of the Minister of Public Instruction in France, to inquire into the subject of Lightning-conductors.

M. G. Lemoine, Secretary of the Société Météorologique de France.

M. Otto von Struve, Director of the Imperial Observatory at Pulkowa, Russia, with reference to the testing of the Pulkowa Photo-heliograph.

The Committee append to the Report a statement of the total receipts and expenditure of the Observatory up to October 31, 1872.

Kew Observatory Revenue and Expenditure Account from August 22, 1871, to October 31, 1872.

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Report of the Kew Committee.

<i>Dr.</i>	REVENUE.		EXPENDITURE.		<i>Cr.</i>
	£	s. d.			£ s. d.
To British Association.....	300	0 0	By Salaries and extra work		1168 3 8
Royal Society (Gassiot Trust).....	600	0 0	Rent of Land.....	22 0 0	
Meteorological Committee	767	18 5	Fuel and Gas.....	71 5 11	
Verification Fees.....	125	6 0	Furniture and Fittings	96 2 9	
Fees for Instruction of Observers	4	4 0			159 8 8
Sale of Waxed Paper	42	7 2	Printing and Stationery.....	32 19 5	
Sale of Standard Thermometer	1	0 0	Postages.....	9 10 4	
Services of Assistant	7	10 0	Messenger and Housekeeper	62 0 0	
Purchase of Instruments for Correspondents	209	0 7	Night Observer.....	3 13 6	
Sale of old material.....	3	11 0	Porterage and Contingencies	38 0 2	
Mr. De La Rue for Sun-work.....	20	13 1	Instruments on Commission account		146 3 5
Meteorological Office for Anemograph papers	3	2 6	Postages and Porterages, Meteorological Committee account.....		290 0 8
		23 15 7	Preparation of Waxed Paper.....		13 10 2
			Verification Department expenses		31 9 6
			Apparatus and Material		0 13 8
			Sun-work expenses		45 0 9
			Anemograph papers, Meteorological Office		22 19 1
			Dr. B. Stewart, balance as per printed statement	40 16 3	3 2 6
			"	134 19 4	
			"	175 15 7	
			" less Cash at Observatory	17 0 5	
			Cash in hand	50 5 9	158 15 2
			London and Westminster Bank	34 19 9	
					85 5 6
					£2084 12 9

Examined, compared with the vouchers, and found correct. (Signed) W. J. SMYTHE, Major-General, Auditor.
November 11, 1872.

ASSETS.		LIABILITIES.	
£	s. d.		£ s. d.
By Balance as above.....	85 5 6	To Gas and Fuel	20 11 3
Due for Verification Fees, Meteorological	77 0 10	House expenses.....	3 1 11
" " Magnetical	42 0 0	Stationery and Printing	17 13 6
		Chemicals	3 18 0
By Instruction Fees	119 0 10	Balance	252 16 3
Standard Thermometers sold	10 0 0		
Waxed Paper sold	8 0 0		
Meteorological Committee, one month's allowance.....	54 3 4		
" " balance of Postage account.....	0 15 11		
Sundry sums due on Commission account	54 19 3		
	10 19 10		
			<u>£298 0 11</u>